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Working Paper on the destruction of chemical and biological means of warfare

The Secretary-General of the United Nations has called upon all states to reach agreement to halt the development, production and stockpiling of all chemical and bacteriological (biological) agents for purposes of war and to achieve their effective elimination from the arsenals of weapons. One aspect of this elimination is destruction of already existing chemical and biological means of warfare as foreseen both in the nine countries' revised draft convention on the prohibition of the development, production and stockpiling of chemical and bacteriological (biological) weapons and on the destruction of such weapons (A/8136) and in the revised text of the United Kingdom draft convention for the prohibition of biological methods of warfare (CCD/255/Rev.2).

Different attempts have been made to solve the problem of disposing of chemical and biological means of warfare. Recently, an operation whereby chemical munitions (rockets) containing nerve gas were sunk in the Atlantic became widely known and was extensively reported on (see "Hearings before the Sub-committee on Oceanography of the Committee on Merchant Marine and Fisheries; House of Representatives Aug 3, 4, 6 and 7, 1970, Washingon, D.C."). This report dealt thoroughly with several means of disposal and destruction and also provided the information that some types of equipment for destruction was under construction.

In the present working paper the principles of destruction of both chemical and biological means of warfare are outlined. An element of importance that has been taken into account is that the effectiveness of the destruction should be easily observed and verified.

CHEMICAL AGENTS

The following is applicable to nerve and mustard gases which are considered to be representative of the most dangerous compounds and, furthermore, are stockpiled in various parts of the world in great quantities. Such agents may be stockpiled in various ways which cause different technical problems when it comes to destruction.

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They may, e.g., be stockpiled in

(a) containers in which the agents are easily accessible;

(b) munitions, containing explosives and perhaps propellants, from which the agents are accessible without prior defusing;

(c) munitions, the explosive part of which has to be defused before it can be emptied of the agent.

In the cases (b) and (c) the explosive part of the munitions causes special problems, particularly in the latter case where simultaneous destruction of the explosive part and the agents seems unavoidable. Thus, from the point of view of destruction, two alternatives can be anticipated:

(1) pure agents

(2) agents which are inseparable from munitions.

In the case of a pure agent two principally different methods for the destruction are conceivable.

One is by means of reactive chemicals (in a water solution) which detoxify the agent and the second, which is also more likely to be generally applicable, by thermal destruction (i.e., decomposition by heating/pyrolysis/or combustion).

The chemical method may involve use of alkali or oxidants (e.g., bleach). Chemical destruction generally gives nontoxic end-products, but the character of the products makes them an environmental hazard if introduced directly into the open, the ground, sea, lakes or rivers. The question of how to dispose of large quantities of the end-products, derived from the different chemical destruction methods, will have to be investigated further. Special facilities may have to be constructed.

Heating the agents themselves in autoclaves is technically feasible but may lead to some complex end-products about which relatively little is known.

Combustion, in combination with absorption of potential pollutants from the exhaust gases, appears to be the most promising method - technically and from the point of view of environmental pollution. A suitable combustion process would require specially constructed facilities.

The advantage of the thermal destruction methods would be that smaller destruction units might be used for a given amount of the agents and that the end-products are more easily handled. Actual experiments would have to be performed to evaluate the order of the most feasible technical steps.

In the case of munitions from which the agent cannot be separated easily, much more drastic procedures seem to be necessary. Use of underground nuclear explosions has been discussed and found technically feasible but were discarded in the earlier mentioned case for several reasons, among them the risks involved in handling the defective munitions (Hearings before the Sub-Committee on Oceanography of the Committee on Merchant Marine and Fisheries; House of Representatives Aug 3, 4, 5 and 7, Washington, D.C. 1970). Instead, the formerly widely used method of disposal by sinking the munitions in the sea was applied. The agents, when released from their containers, will be destroyed by chemical reactions with the sea water in due time. However, this method will be less attractive with regard to some of the nerve gases and the mustard gases, which need a considerably longer period to react with water. In addition, attention should be paid to the provisions of the recent Seabed Treaty which prohibit, i.a., the storing of chemical and biological weapons on the seabed.

Another less attractive alternative is treatment of the munitions with lime or bleach in old mines or underground in places chosen with great care.

Underwater detonation in closed-off water-filled pools together with facilities to take care of the toxic gases that may escape from the water surface might be feasible. Any of the mentioned methods are cumbersome. However, the greatest part of the existing chemical warfare agents can apparently be destroyed as such and according to the procedures suggested for pure agents.

BIOLOGICAL AGENTS

Biological agents may be destroyed by combustion, in autoclave or by means of disinfectants. Also, destruction of biological agents has its hazards, but offers in general smaller problems than chemical agents, especially since the quantities to be destroyed, and accordingly also the quantities of end-products, should be much smaller than is the case with the chemical warfare agents. Various destruction facilities intended for ordinary peaceful purposes already exist.

CONCLUSION

The destruction of munitions and agents intended for chemical and biological warfare is technically feasible. Because of the high toxicity and infectiousness of the agents, hazards may in certain cases cause considerable destruction costs due to the need for special technical facilities. The destruction methods recommended above may be subject to verification without major technical difficulties, but apparently only with inspectors present at the site of destruction.